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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/554,136	05/12/2006	Hiroshi Kawazoe	3836.001	9371
22337 7590 01/07/2010 LAW OFFICES OF CHARLES GUENZER P O BOX 60729 PALO ALTO, CA 94306				
EXAMINER				
HSIEH, HSIN YI				
ART UNIT		PAPER NUMBER		
2811				
MAIL DATE		DELIVERY MODE		
01/07/2010		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/554,136

Applicant(s)

KAWAZOE ET AL.

Examiner

Hsin-Yi (Steven) Hsieh

Art Unit

2811

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 September 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 4-9 and 11-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-2, 4-9, and 11-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 July 2009 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB08)
- Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07/03/2009 has been entered.

Drawings

2. Figure 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Fig. 2 was labeled "Prior Art" in the drawings filed on 12/22/2008 but "Prior Art" was removed in recent drawings filed on 07/03/2009. Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to because Fig. 6 on page 5 seems to be actually Fig. 5. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should

include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. **Claims 11 and 16** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

6. Claim 11 recites "the light-emitting layer has a uniform composition across its thickness" in the first two lines of the claim which lacks the support in the original disclosure. The original disclosure does not discuss the uniform composition at all.

7. Claim 16 recites "the ambipolar light-emitting layer includes no quantum well and associated barriers" which lacks the support in the original disclosure. The original disclosure does not discuss the quantum well at all.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. **Claims 1-2, 4-9 and 11-18** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

10. Claim 1 recites the limitation "the light-emitting layer" in 4th line of the claim. There is insufficient antecedent basis for this limitation in the claim.

11. Claim 13 recites the limitation "an ambipolar light-emitting layer continuously extending from the n-electrode to the p-electrode, consisting of" in the 4th and 5th lines of the claim. It is unclear which limitation "consisting of" refers to "an ambipolar light-emitting layer" or "the p-electrode".

12. Claim 13 recites the limitation "an ambipolar semiconductor material" in the 4th line of the claim and "a first ambipolar semiconductor material" in the 7th and 8th lines of the claim. It is unclear whether these two limitations refer to the same material or different material (i.e. Is the "first ambipolar semiconductor material" referring to the same layer as "an ambipolar semiconductor material").

13. The term "essentially" in claim 17 is a relative term which renders the claim indefinite. The term "essentially" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The limitation "the light-emitting layer consists essentially of the ambipolar inorganic semiconductor material" has been rendered indefinite by the use of the term "essentially".

14. Claim 18 recites "a conduction band edge energy" in the 11th line of the claim, while a reference energy level is not defined. The energy level of the conduction band edge is only meaningful when a reference energy level, i.e. 0 energy level is defined. Without defining the reference energy level, the conduction band edge energy is ambiguous. Applicant is advised to specify the reference energy level or use a term that already has the reference level defined, e.g. electron affinity.

15. Claims 2, 4-9, 11-12, and 14-16 are rejected because they depend on the rejected claims 1 and 13.

Claim Rejections - 35 USC § 102

16. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

17. **Claims 1-2, 4-9 and 11-18** are rejected under 35 U.S.C. 102(b) as being anticipated by Kawazu et al. (US 5,539,239 A) as can be understood since claims 1-2, 4-9, and 11-18 have been rejected under 35 U.S.C. 112.

18. Regarding **claim 1**, Kawazu et al. teach a light-emitting diode (semiconductor light emitting element; Abstract) characterized by comprising: an electron injecting electrode, that is, an n-electrode (n type ZnSe cladding layer 5; Fig. 1, col. 7 lines 13-14); a hole injecting electrode, that is, a p-electrode (p type ZnSe cladding layer 3; Fig. 1, col. 7 line 8); and an inorganic light-emitting layer (undoped ZnSe active layer 4; Fig. 1, col. 7 lines 11-12) wherein the light-emitting layer (4) (1) formed of an ambipolar inorganic material (ZnSe which is ambipolar that can transport electrons and holes), (2) is disposed between the n-electrode (5) and the p-electrode (3) so as to respectively contact the n-electrode and the p-electrode (5 and 3) in a non-barrier junction manner (5, 4, 3 form a p-i-n diode which is considered in a non-barrier junction manner as the diode conducts in the forward biased condition) such that the ambipolar inorganic material (undoped ZnSe) conducts both electrons injected from the n-electrode (5) and holes injected from the p-electrode (3; conducting both electrons and holes is an intrinsic property of undoped ZnSe), and (3) has a thickness in a range of 10 nm or more and 10 μ m or less (10 nm; col. 7 lines 11-12), wherein the ambipolar inorganic semiconductor material (4) is selected from the group consisting of (a) a group II-VI compound and (b) Zn and at least one element selected from the group consisting of S, Se and Te (i.e. Zn and Se).

19. Regarding **claim 2**, Kawazu et al. also teach the light-emitting diode according to claim 1, characterized in that the inorganic light-emitting layer (4) consists of a semiconducting

material (undoped ZnSe) having a dopant concentration of 0.1% or less in atomic ratio (zero as it is undoped).

20. Regarding **claim 4**, Kawazu et al. also teach the light-emitting diode according to claims 1 or 2, characterized in that the n-electrode (5) includes a layer (5) comprising an n-type inorganic semiconductor material (n-type ZnSe; col. 7 lines 13-14) comprising an n-type dopant (Cl; col. 7 line 15) and the ambipolar inorganic semiconductor material (ZnSe is ambipolar which can transport electrons and holes).

21. Regarding **claim 5**, Kawazu et al. also teach the light-emitting diode according to any claims 1 or 2, characterized in that the p-electrode (3) includes a layer (3) comprising a p-type inorganic semiconductor material (p type ZnSe; col. 7 line 8) comprising a p-type dopant (N; col. 7 line 10) and the ambipolar inorganic semiconductor material (ZnSe is ambipolar which can transport electrons and holes).

22. Regarding **claim 6**, Kawazu et al. also teach the light-emitting diode according to claims 1 or 2, characterized in that the n-electrode (5) includes a first layer (5) comprising an n-type inorganic semiconductor material (n-type ZnSe; col. 7 lines 13-14) comprising an n-type dopant (Cl; col. 7 line 15) and the ambipolar inorganic semiconductor material (ZnSe is ambipolar which can transport electrons and holes), and the p-electrode (3) includes a second layer (3) comprising a p-type inorganic semiconductor material (p type ZnSe; col. 7 line 8) comprising a p-type dopant (N; col. 7 line 10) and the ambipolar inorganic semiconductor material (ZnSe is ambipolar which can transport electrons and holes).

23. Regarding **claim 7**, Kawazu et al. also teach the light-emitting diode according to claims 1 or 2, characterized in that a material (ZnSe) of a portion contacting the light-emitting layer (4)

in at least one of the n-electrode (5) and the p-electrode (3) is formed by use of a material (ZnSe) substantially different from the material of the light-emitting layer (CdZnSe of the CdZnSe-ZnSe multi-quantum well layer 21; Fig. 6, col. 2 lines 42-43)

24. Regarding **claim 8**, Kawazu et al. also teach the light-emitting diode according to claims 1 or 2, characterized in that the ambipolar inorganic semiconductor material (4) is formed on a crystalline substrate or a glass substrate (GaAs substrate 1; Fig. 1, col. 7 line 4), and the n-electrode (5) and the p-electrode (3) are formed on opposing sides of the ambipolar inorganic semiconductor material (4) wherein the n-electrode (5) and the p-electrode (3) do not contact each other (see Fig. 1).

25. Regarding **claim 9**, Kawazu et al. also teach the light-emitting diode according to claims 1 or 2, characterized in that a first one of the n-electrode (5) and the p-electrode (3) is formed on a crystalline substrate or a glass substrate (GaAs substrate 1; Fig. 1, col. 7 line 4), and the ambipolar inorganic semiconductor material (4) is stacked thereon (4 is stacked on 1), and a second one of the p-electrode (5) and the n-electrode (3) is stacked thereon (5 and 3 are stacked on 1).

26. Regarding **claim 11**, Kawazu et al. also teach the light emitting diode according to claim 1, wherein the light-emitting layer (4) has a uniform composition across its thickness (implied as a single piece of ZnSe).

27. Regarding **claim 12**, Kawazu et al. also teach the light emitting diode according to claim 1, wherein only one such light-emitting layer (4) is formed between the p-electrode (3) and the n-electrode (5).

28. Regarding **claim 13**, Kawazu et al. also teach a light-emitting diode (semiconductor light emitting element; Abstract), comprising: an electron injecting n-electrode (n type ZnSe cladding layer 5; Fig. 1, col. 7 lines 13-14); a hole injecting p-electrode (p type ZnSe cladding layer 3; Fig. 1, col. 7 line 8); an ambipolar light-emitting layer (undoped ZnSe active layer 4; Fig. 1, col. 7 lines 11-12) continuously extending from the n-electrode (5) to the p-electrode (3; see Fig. 1), consisting of an ambipolar semiconducting material (undoped ZnSe, an ambipolar material which can transport electrons and holes; col. 7 lines 11-12) which conducts both electrons injected by the n-electrode (5) and holes injected by the p-electrode (3; conducting both electrons and holes is an intrinsic property of undoped ZnSe), having a thickness in a range of greater than 10 nm and no more than 100 nm (10 nm; col. 7 lines 11-12), and comprising a first ambipolar semiconductor material (ZnSe) selected from the group consisting of (a) a group II-VI compound and (b) Zn and at least one element selected from the group consisting of S, Se and Te (i.e. ZnSe).

29. Regarding **claim 14**, Kawazu et al. also teach the light-emitting diode of claim 13, wherein the ambipolar light-emitting layer (4) consists of the first ambipolar semiconductor material (ZnSe; col. 7 lines 11-12).

30. Regarding **claim 15**, Kawazu et al. also teach the light-emitting diode of claim 13, wherein the first ambipolar semiconductor material (ZnSe) is Zn and at least one element selected from the group consisting of S, Se and Te (i.e. Se).

31. Regarding **claim 16**, Kawazu et al. also teach the light-emitting diode of claim 13, wherein the ambipolar light-emitting layer (4) includes no quantum well and associated barriers (col. 7 lines 11-12).

32. Regarding **claim 17**, Kawazu et al. also teach the light-emitting diode according to claim 1, wherein the light-emitting layer (4) consists essentially of the ambipolar inorganic semiconductor material (ZnSe; col. 7 lines 11-12).

33. Regarding **claim 18**, Kawazu et al. teach a light-emitting diode (semiconductor light emitting element; Abstract) characterized by comprising: an electron injecting electrode, that is, an n-electrode (n type ZnSe cladding layer 5; Fig. 1, col. 7 lines 13-14); a hole injecting electrode, that is, a p-electrode (p type ZnSe cladding layer 3; Fig. 1, col. 7 line 8); and an inorganic light-emitting layer (undoped ZnSe active layer 4; Fig. 1, col. 7 lines 11-12), wherein the light-emitting layer (4) is disposed between the n-electrode (5) and the p-electrode (3) so as to respectively contact the n-electrode (5) and the p-electrode (3; see Fig. 1) and is formed of an ambipolar inorganic semiconductor material (undoped ZnSe, an ambipolar material which can transport electrons and holes; col. 7 lines 11-12) and has a thickness in a range of 10 nm or more and 10 μ m or less (10 nm; col. 7 lines 11-12), wherein the ambipolar inorganic semiconductor material (undoped ZnSe) is selected from the group consisting of (a) a group II-VI compound and (b) Zn and at least one element selected from the group consisting of S, Se and Te (i.e. Zn and Se), wherein the n-electrode (n type ZnSe) has a work function lower than a conduction band edge energy of the ambipolar inorganic semiconductor material (undoped ZnSe), and wherein the p-electrode (p type ZnSe) has a work function higher than the conduction band edge energy of the ambipolar inorganic semiconductor material (undoped ZnSe; this relationship of work functions and conduction band edge energy is intrinsically satisfied as the three layer structure of p-ZnSe/undoped_ZnSe/n-ZnSe with undoped ZnSe as the active layer is exactly the same as the examples shown in the second paragraph of page 25 of the instant application).

Response to Arguments

34. Applicant's amendments, filed 07/03/2009, overcome the objections to drawings, claims 4-7, double patenting, and the rejections to claims 1-2, 4-9, 12, and 13-15 under 35 U.S.C. 112. The objections to drawings, claims 4-7, double patenting, and the rejections to claims 1-2, 4-9, 12, and 13-15 under 35 U.S.C. 112 have been withdrawn. The rejection to claims 11 under 35 U.S.C. 112 still stands because claim 11 is not amended to overcome the rejection.
35. Applicant's arguments with respect to claims 1 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsin-Yi (Steven) Hsieh whose telephone number is 571-270-3043. The examiner can normally be reached on Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on 571-272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lynne A. Gurley/
Supervisory Patent Examiner, Art Unit
2811

/Hsin-Yi (Steven) Hsieh/
Examiner, Art Unit 2811
12/15/2009